Groundwater and Surface Water at the Santa Susana Field Laboratory (SSFL)

Community Advisory Group Meeting
6:30 pm
May 21, 2014

Tom Seckington, PG, CHG — DTSC
Roger Paulson, PE — DTSC
Cassandra Owens — LARWQCB

Department of Toxic Substances Control

CALIFORNIA Water Boards

Los Angeles Regional Water Quality Control Board

Presentation Outline

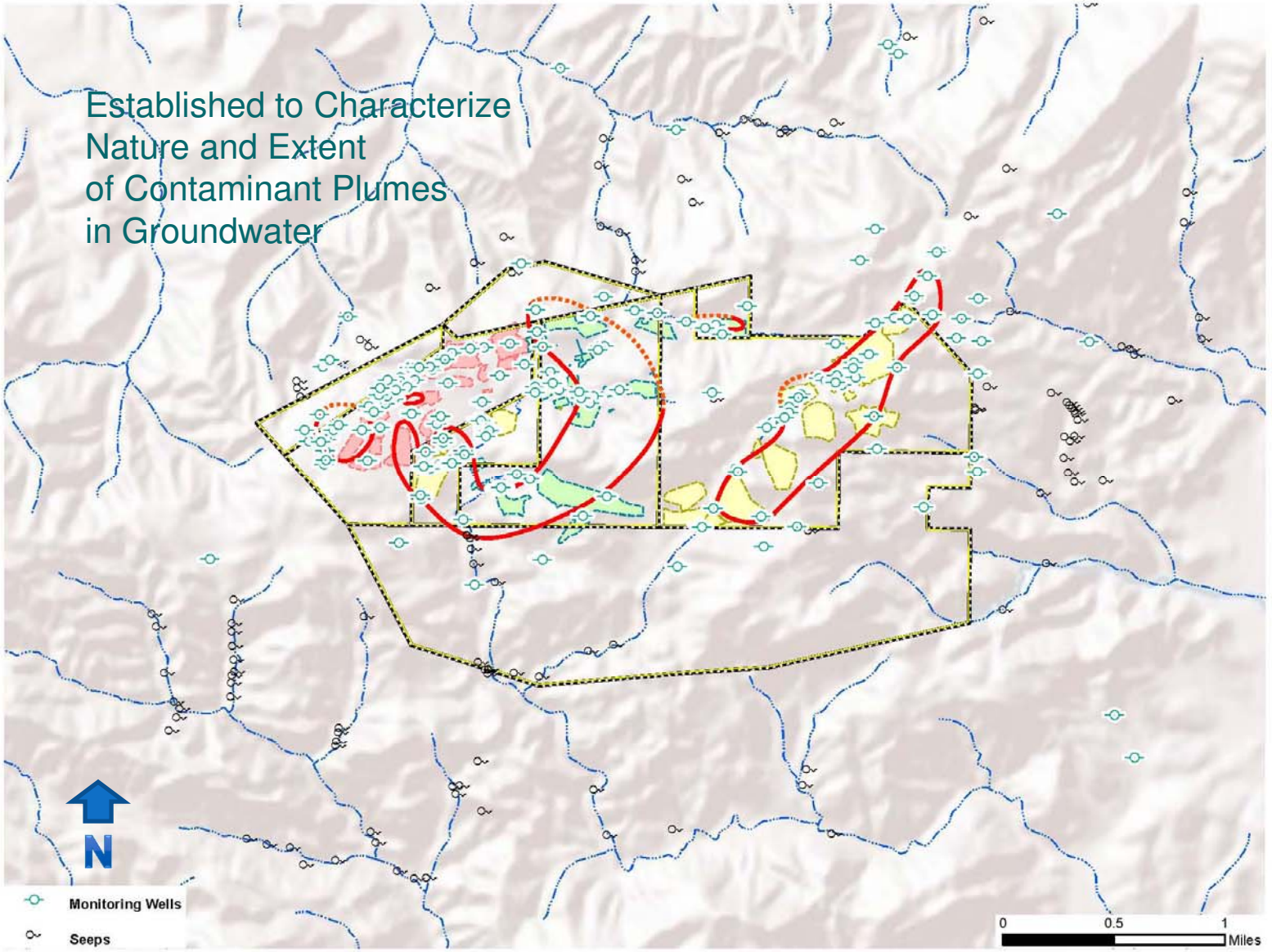
- **Groundwater**
  - Characterization and Monitoring
  - The Occurrence of Perchlorate in Simi Valley
  - Testing of offsite well OS-10
- **Seeps/Springs**
  - Investigation
  - Monitoring
- **Surface Water**
  - Monitoring
  - Mitigation and Treatment
- **Questions**

Characterization of Groundwater

Groundwater Characterization Focuses on:

- GROUNDWATER MOVEMENT - Drilling wells; sampling groundwater; assessing the nature of geologic structures; evaluation groundwater chemical data; conducting aquifer tests; and running computer groundwater flow models
- CONTAMINANT SOURCES - Extensive soil, soil gas, and groundwater sampling.
- CONTAMINANT MOVEMENT – Evaluate groundwater chemical data and conduct laboratory bench test

Groundwater Monitoring Network

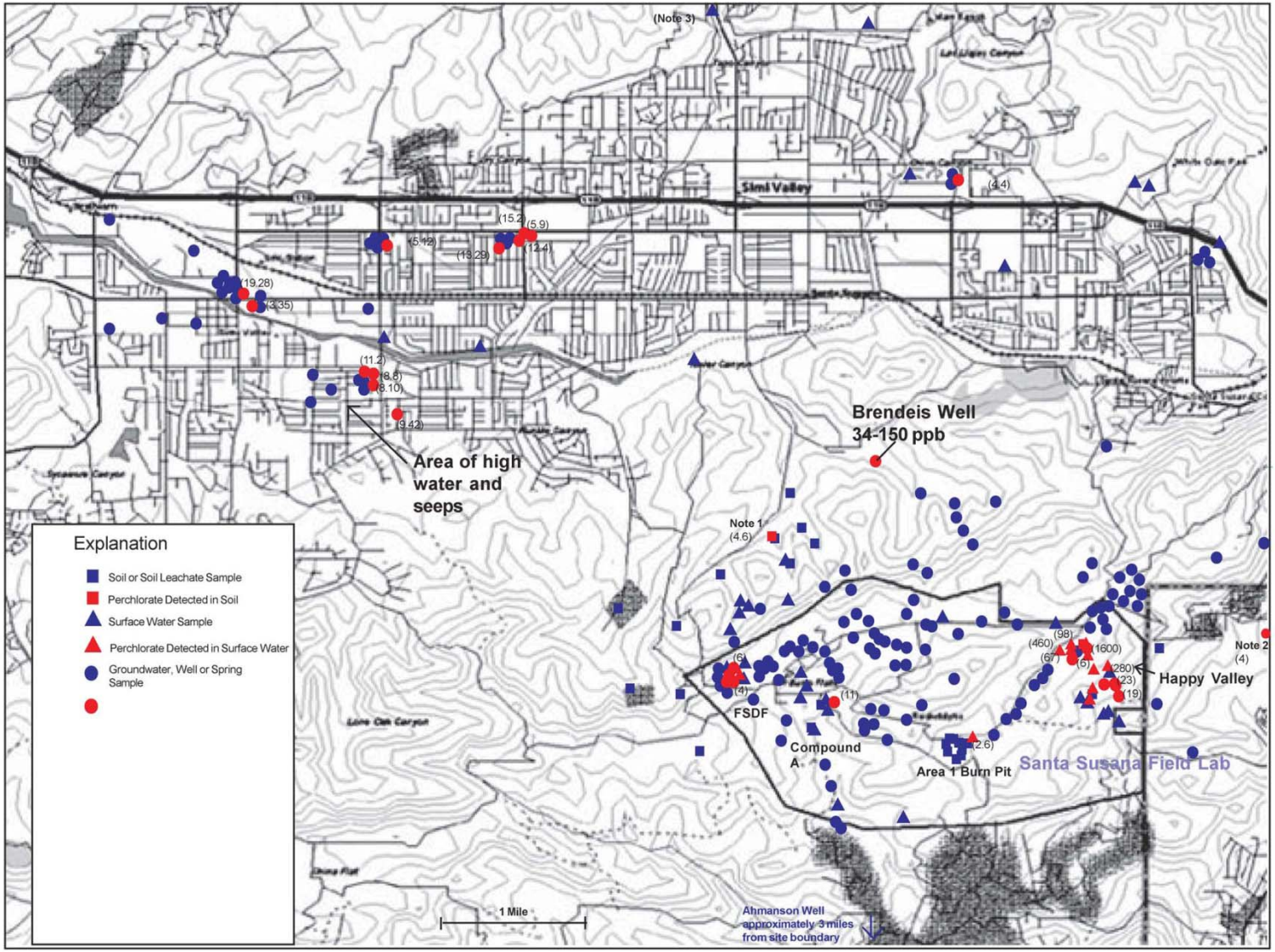


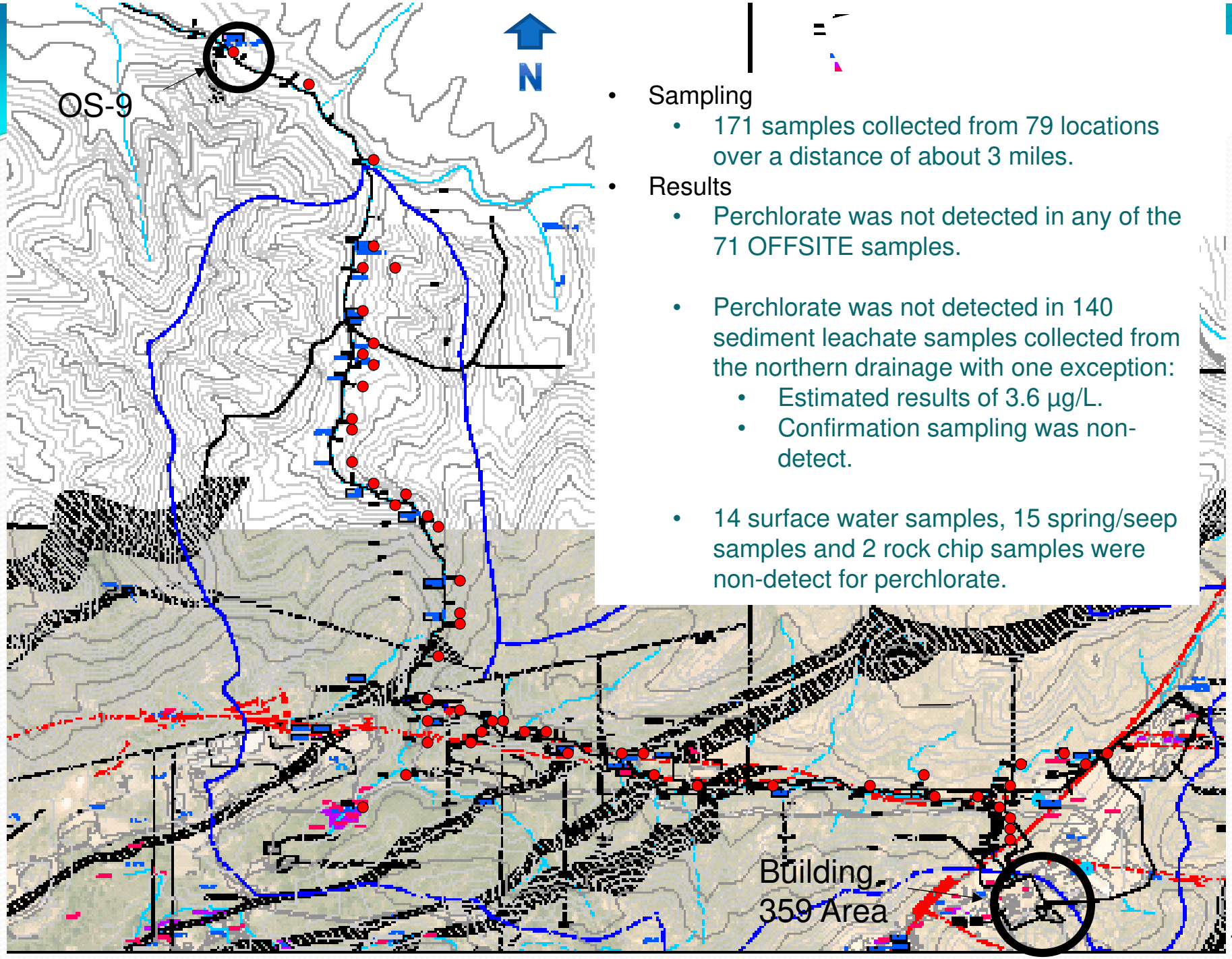
Groundwater Monitoring Network

SUMMARY

- There are over 450 monitoring wells/piezometers at the site and the area surrounding the site.
- Over 280 monitoring wells/piezometers are monitored quarterly.
- Over 170 monitoring wells/piezometers are sampled routinely either semi-annually or annually.
- Shallow groundwater wells at seeps/springs are being installed around the site.
- Additional wells are being installed and sampled as needed to meet various data quality objectives at the site.

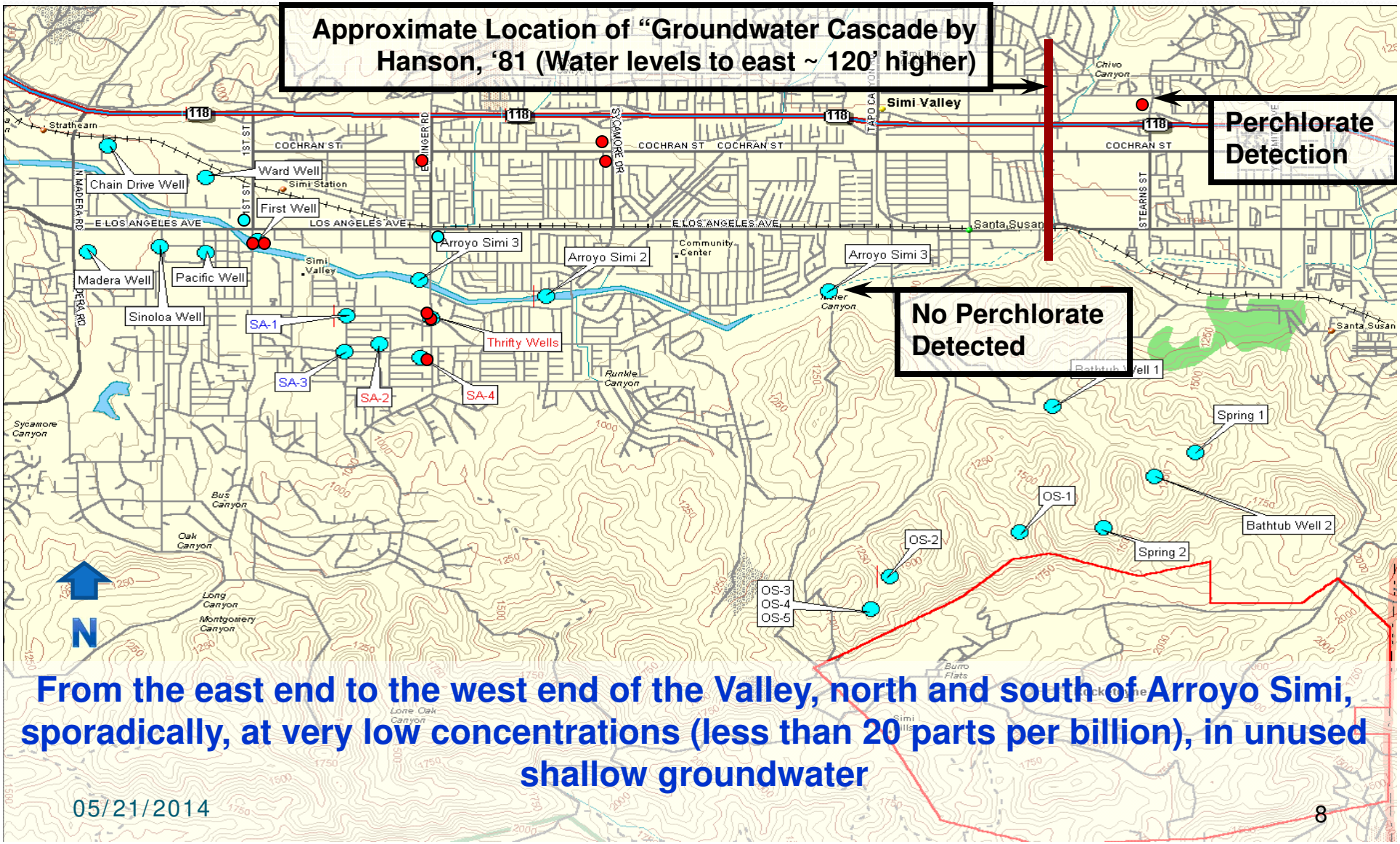
Perchlorate in Simi Valley Groundwater





- Sampling
  - 171 samples collected from 79 locations over a distance of about 3 miles.
- Results
  - Perchlorate was not detected in any of the 71 OFFSITE samples.
  - Perchlorate was not detected in 140 sediment leachate samples collected from the northern drainage with one exception:
    - Estimated results of 3.6 µg/L.
    - Confirmation sampling was non-detect.
  - 14 surface water samples, 15 spring/seep samples and 2 rock chip samples were non-detect for perchlorate.

Perchlorate in Groundwater



From the east end to the west end of the Valley, north and south of Arroyo Simi, sporadically, at very low concentrations (less than 20 parts per billion), in unused shallow groundwater

Offsite Groundwater
Perchlorate in Simi Valley

SUMMARY

- Soil, sediment, surface water, and groundwater samples have been collected onsite and offsite
- The occurrence of perchlorate at the site generally appears to be local to where it was released.
- Evaluation of the surface and groundwater pathways of perchlorate offsite does not indicate a connection between the perchlorate detected in Simi Valley and perchlorate present in the soil and groundwater at SSFL.
- As a result, DTSC's focus remains to be refining the characterization of the onsite perchlorate sources.

Offsite Groundwater
Radionuclides in OS-10

Offsite Groundwater
Radionuclides in OS-10

5.2.2.3 Off-Site Wells

Twelve off-site wells (OS-2, OS-3, OS-4, OS-9, OS-9R, OS-10, RD-59A, RD-59B, RD-59C, RD-68A, RD-68B, and WS-09) were sampled during the Phase II sampling event.

Adjusted gross alpha activity was reported above the MCL (15 pCi/L) in the total fraction of the sample collected from well OS-10 at a concentration of 129 pCi/L. The filtered fraction (water only) of the sample had an adjusted concentration of 0.758 pCi/L. The suspended fraction (solids only) contained a concentration of 128.7 pCi/L (Figure 5.10).

Gross beta radiation also was reported above the MCL of 50 pCi/L in the total fraction of the sample collected at off-site well location OS-10, with a concentration of 145 pCi/L. The filtered fraction of the sample contained a concentration of 6.15 pCi/L, and the suspended fraction contained a concentration of 139 pCi/L (Figure 5.10).

OS-10 is an artesian well which at the time of sampling was not flowing. The sample collected was from ponded water associated with the well. The sample contained a high amount of sediment (solids) and the turbidity was 5,999 NTUs. An NTU of 50 is desired and an NTU of 10 is optimal (HGL, 2010). The elevated levels of suspended and total gross alpha and beta are attributed to the very high turbidity of the sample and is considered to be a result of naturally occurring radionuclides.

No other radionuclides were detected at concentrations greater than the MCL in any of the off-site wells sampled.

From:
Final Groundwater Report
Area IV Radiological Study
Santa Susana Field Laboratory
(USEPA July 24, 2012)

DTSC was concerned that solids in EPA sample contained naturally occurring radiation

Offsite Groundwater
Radionuclides in OS-10

- DTSC re-sampled OS-10 on February 18, 2014
  - Sample collected from flowing from well.
  - Samples analyzed for fluoride, perchlorate, volatile organic compounds (VOCs), and for radionuclides including gross alpha, gross beta, cesium-137, strontium-90, tritium, and others.

- Sample Results
  - No VOCs, perchlorate, or radionuclides were detected in the groundwater samples collected by DTSC.
  - Fluoride concentrations were within background concentrations.

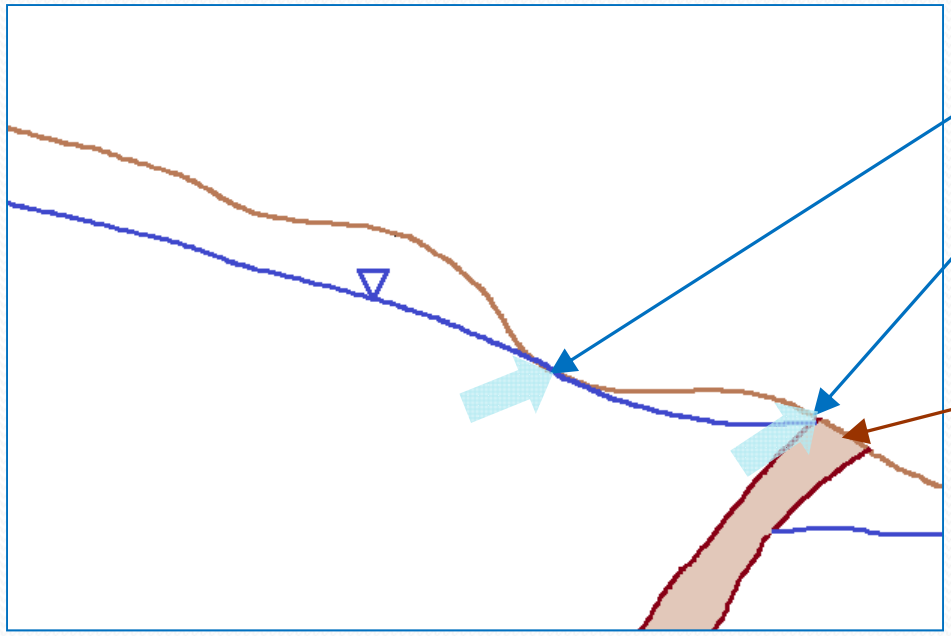
Investigation and Monitoring of Seeps and Springs at SSFL

Roger N. Paulson, PE

Department of Toxic Substances Control

Seeps and Springs
What and Where

- Seeps occur where the Groundwater Elevation intersects the Ground Surface


Seep Location controlled by topography
Seep Location controlled by Geology
Geologic Feature (Impermeable Layer or Fault)

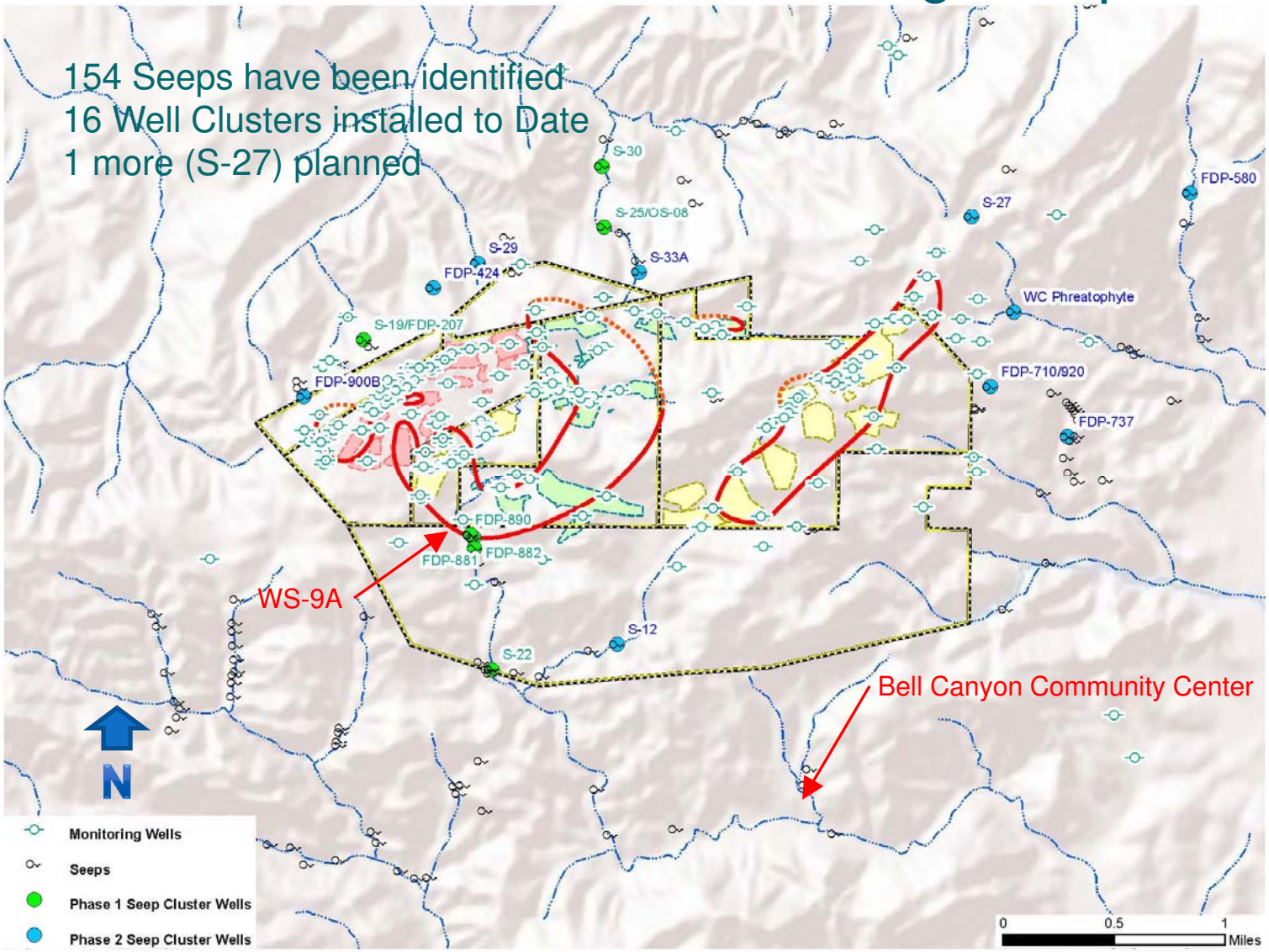
- Primary cause is Topography, but other factors may contribute
  - Lithology (impermeable layers)
  - Faulting

Seeps and Springs Timeline

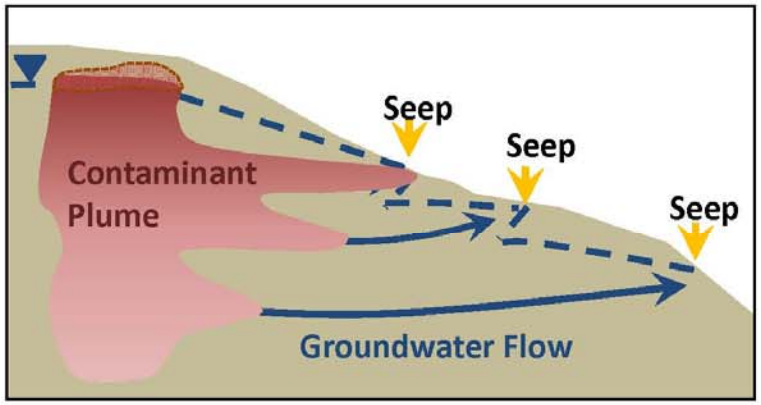
- 1985 Seeps Surrounding Site are Identified
  - Monitoring begins
- 2002 9 Seeps Sampled
  - VOCs, Perchlorate, Radionuclides, Stable Isotopes General Chemistry
  - Site Contaminants not Detected at Off-Site Locations
- 2003 – 2007 Investigation and Sampling For Groundwater Report
  - Search for Additional Surface Discharge Features (Seeps)
  - 54 Seep Discharge Locations Sampled for VOCs, stable isotopes general chemistry
    - No VOCs Detected at Off-Site Locations
- 2010 – Present Work to Fill Data Gaps
  - 57 seeps identified as 'potentially able to be sampled'
  - 5 Seep Discharge Locations Sampled as part of 2012 Seeps Work Plan
    - No VOCs Detected
  - Installation of Cluster Wells to Monitor Seeps
    - 7 well clusters installed in 2011
    - 9 well clusters installed in 2013
    - 1 well cluster remaining to be installed in 2014

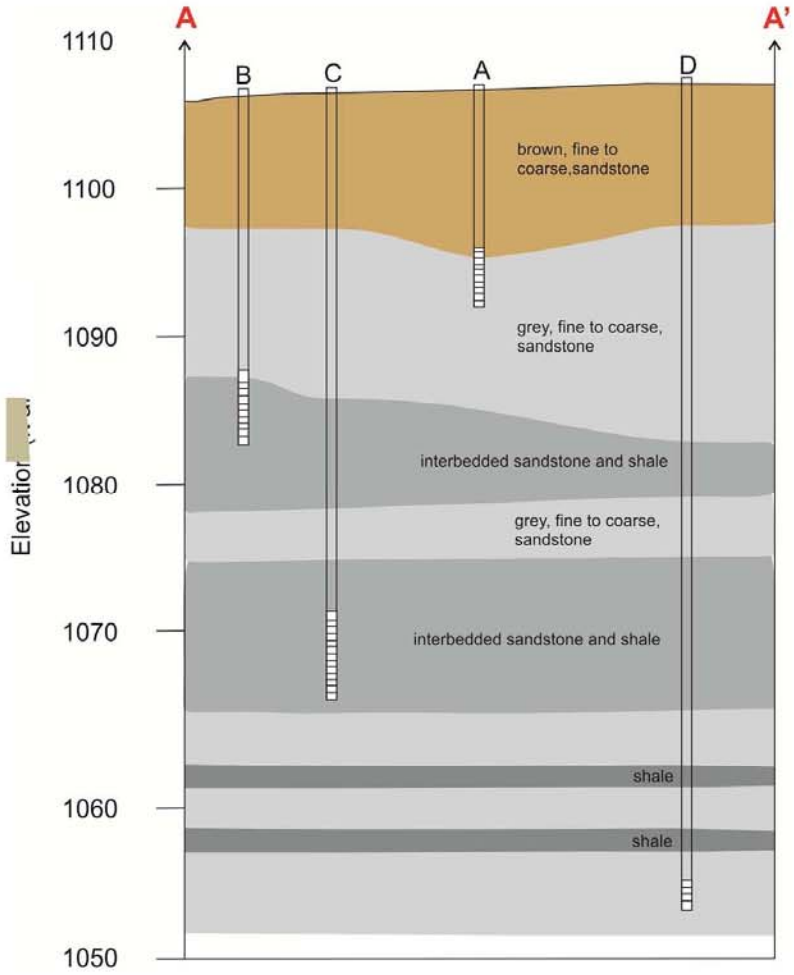
Seeps and Springs

Well Clusters for Monitoring Seeps



Seeps and Springs
Well Clusters for Monitoring Seeps





Seeps and Springs
Well Cluster Sampling

2011 (1st Phase)

- SP-890 (Wells A, B, C, D & G Sampled)
- SP-881 (Wells A, B, C, D & G Sampled)
- SP-882 (Wells A, B, C, D & G Sampled)
- SP-22 (Wells A, B, C & D Sampled)
- SP-30 (Wells A, B, C & D Sampled)
- SP-19 (Wells A & B Sampled)
- SP-25 (Wells A, B, C & D Sampled)

May 2013

- SP-890 (Wells C, D & G Sampled, A & B Dry)
- SP-881 (Wells C, D & G Sampled, A & B Dry)
- SP-882 (Wells B, C, D & G Sampled, A Dry)
- SP-22 (Insufficient Water to Sample Wells A, B, C, & D)
- SP-30 (Wells B, C, D Sampled, A Dry)

June 2013 (2nd Phase)

- SP-19 (Wells A & B Sampled)
- SP-25 (Wells A, B, C & D Sampled)
- SP-29 (Wells A, B & C Sampled)
- SP-12 (Dry, Not Sampled)

November 2013 (2nd Phase)

- SP-424 (Wells A, B & C Sampled)
- SP-33 (Wells A, B & C Sampled)
- SP-900 (Wells A, B & C Sampled)

December 2013 (2nd Phase)

- SP-WC (Dry, Not Sampled)
- SP-710 (Dry, not able to be sampled)
- SP-580 (Insufficient water to sample)
- SP-737 (Wells A, B & C Sampled)

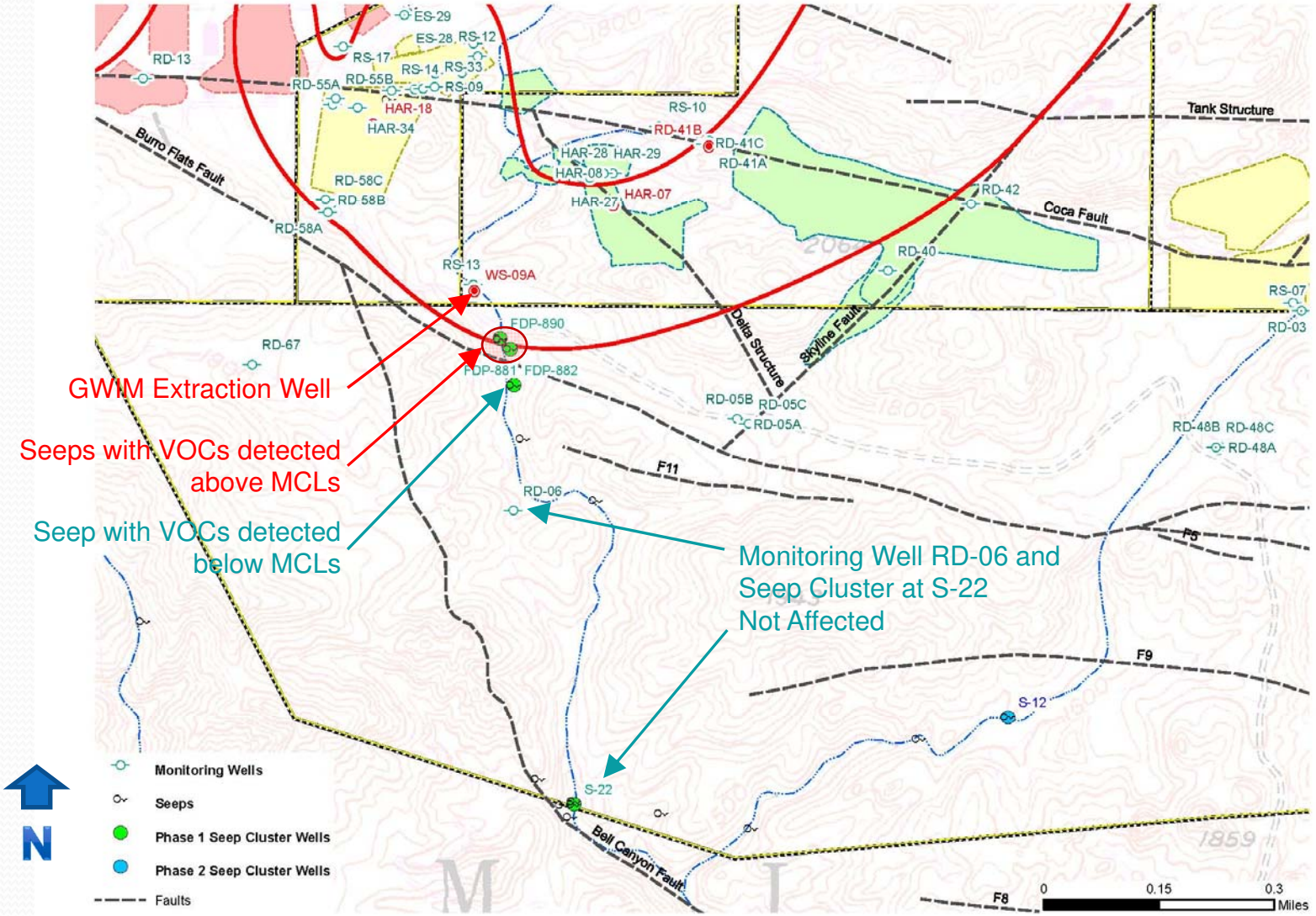
Seeps and Springs Status

- No Groundwater Contaminant Pathway to Offsite Seeps
  - Verified by:
    - Monitoring Well Network Data
    - Seep Sampling Results
  - SSFL COCs are non-detect for all off-site seep well clusters
  - Toluene detected below MCLs in newly installed well clusters
    - Attributed to adhesive on water well tape used during installation

However:

- VOCs are Discharging to Surface at Several On-site Seeps
  - Trichlorethene (TCE) and degradation products detected in SP-890, SP- 881 and SP-882
    - Lower Concentrations than 2011
  - Migration of Contamination is Being Controlled at Seep Discharge
    - Pumping at WS-9A
    - Pumping Standing Water from Seep with Vacuum Truck

Seeps and Springs
Monitoring of On-site Seeps



Seeps and Springs
Moving Forward

- Groundwater Quality will Continue to be Evaluated
  - On-site and Off-site Monitoring Wells
  - Seep Sampling at Seep Well Clusters
- Action will be taken if Completed Pathway is Discovered
  - If Contamination is Detected in Monitored Locations

Surface Water Issues at SSFL

Cassandra Owens

CALIFORNIA Water Boards

Los Angeles Regional Water Quality Control Board

Los Angeles Regional Water Quality Control Board

Preserve and enhance water quality and protect the beneficial uses of all regional waters.

- National Pollutant Discharge Elimination System (NPDES) Permit
- Interim Source Removal Actions

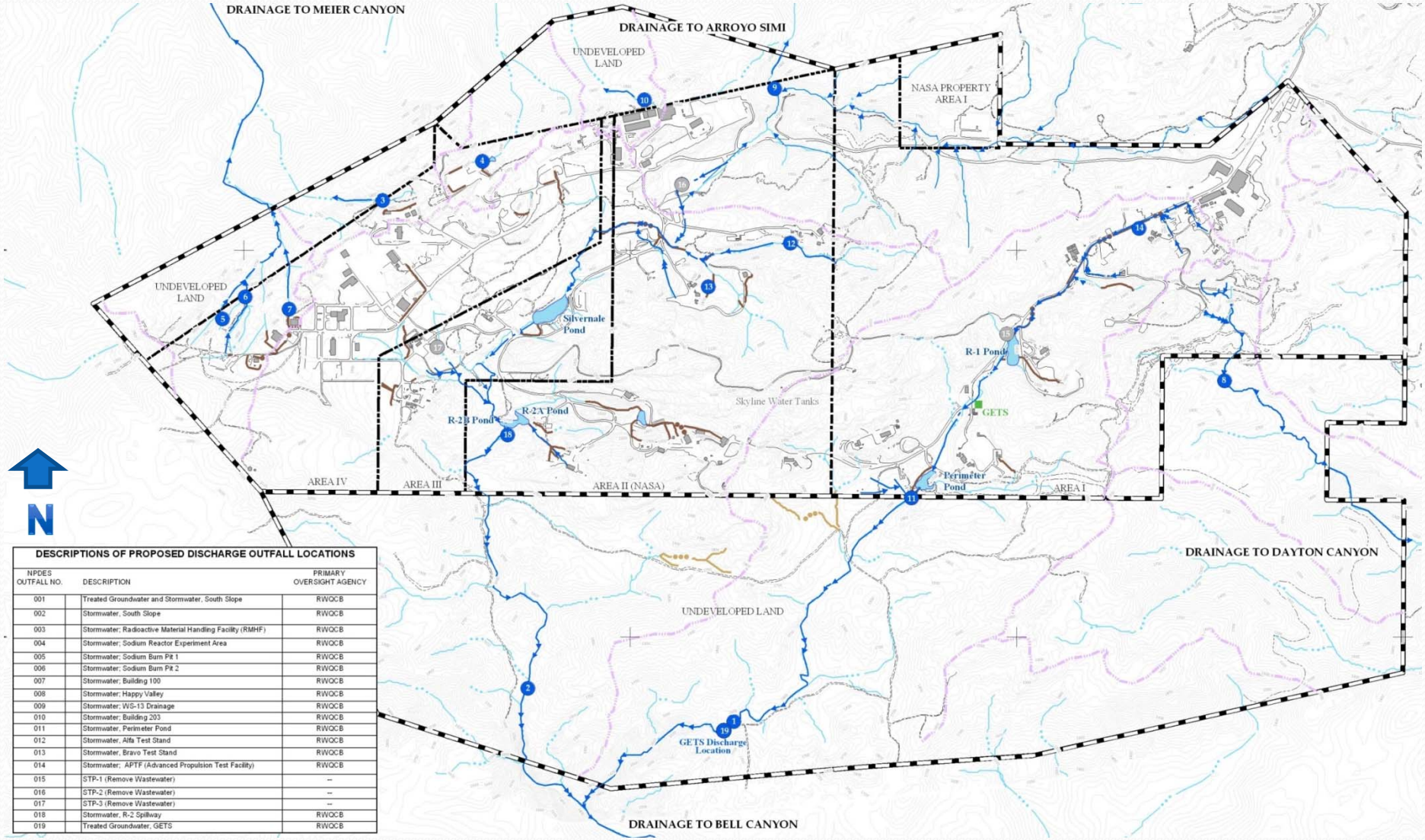
NPDES Permit

- Regulates point source discharges from industrial facilities.
  - Treated groundwater
  - Storm water
- Regulates flow and concentration of contaminants.
  - VOCs, Metals, Radionuclides
  - Others

NPDES Permit

- Effluent Limitations - metals, VOCs, radionuclides, others
- Monitoring Requirements – once per discharge event for storm water and once per month for treated groundwater.
- Fact Sheet – explains the basis for decisions in the permit.

NPDES Outfalls



DESCRIPTIONS OF PROPOSED DISCHARGE OUTFALL LOCATIONS

NPDES OUTFALL NO.		DESCRIPTION	PRIMARY OVERSIGHT AGENCY
001		Treated Groundwater and Stormwater, South Slope	RWQCB
002		Stormwater, South Slope	RWQCB
003		Stormwater; Radioactive Material Handling Facility (RMHF)	RWQCB
004		Stormwater; Sodium Reactor Experiment Area	RWQCB
005		Stormwater; Sodium Burn Pit 1	RWQCB
006		Stormwater; Sodium Burn Pit 2	RWQCB
007		Stormwater; Building 100	RWQCB
008		Stormwater; Happy Valley	RWQCB
009		Stormwater; WS-13 Drainage	RWQCB
010		Stormwater; Building 203	RWQCB
011		Stormwater, Perimeter Pond	RWQCB
012		Stormwater, Alfa Test Stand	RWQCB
013		Stormwater, Bravo Test Stand	RWQCB
014		Stormwater; APTF (Advanced Propulsion Test Facility)	RWQCB
015		STP-1 (Remove Wastewater)	--
016		STP-2 (Remove Wastewater)	--
017		STP-3 (Remove Wastewater)	--
018		Stormwater, R-2 Spillway	RWQCB
019		Treated Groundwater, GETS	RWQCB

NPDES Effluent Limits

- Dioxins (Toxic Equivalents)
  - Daily Maximum Limit
    - 2.8 E-08 µg/L

      or
    - 0.000000028 µg/L
  - 1,000 X more stringent than Drinking Water Limit

Typical Best Management Practices in 2001

Outfall 18. R-2A Pond
March 2007

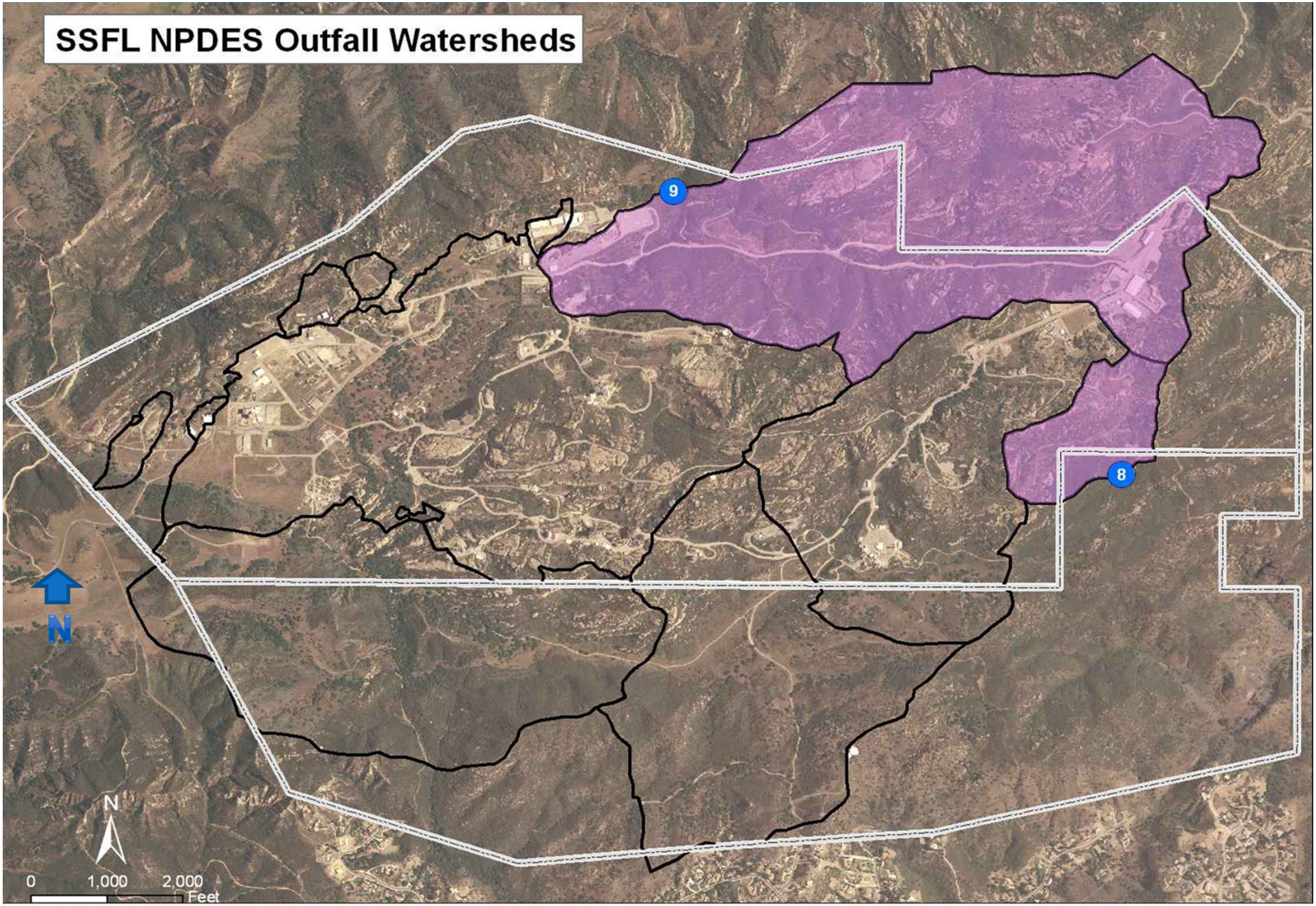
Upstream View After Multiple Filter Bed Installation

Silvernale Pond - 2010, Start-up

Silvernale Pond - May 14, 2014

Interim Source Removal Action

- Initiated in December 2008
- Targeted Outfall 008 and 009 Watersheds
  - Determined Chemicals of Concern
  - Identified areas with elevated levels of COCs
  - Excavated contaminated soils
  - Disposed of contaminated soils


SSFL NPDES Outfall Watersheds
9
8
N
N
0
1,000
2,000
Feet

Interim Source Removal Action

- Excavated approximately 25,000 cubic yards of soil
- Installed new Best Management Practices
- Performance monitoring of the targeted areas is ongoing.

Violations of Daily Maximum Effluent Limits

Outfall	2009	2010	2011	2012	2013	2014
004	2					
006	3	1				
008		3		2		
009		4	1	4		5
010	2	3				2
011	4	8	2			
012	1					
018	4	5	2			
019			3			
Total	16	24	8	5	--	7

Current Status

- No Discharges from the Groundwater Treatment Unit – Outfall 019
- Storm Event on February 28, 2014
  - Discharges from Outfall 009 and 010
  - Outfall 009 – 5 exceedances
    - Lead, TCDD, pH, 2 types of bacteria
  - Outfall 010 – 2 exceedances
    - Lead, TCDD

NPDES Permit Renewal

- Updating the Reasonable Potential Analysis – Effluent limits included in the permit.
- Re-evaluate location of Outfall 019
- Incorporate any new applicable requirements

Groundwater and Surface Water at SSFL

Questions

For Further Information:

http://www.dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/index.cfm

Department of Toxic Substances Control

Marina Perez
marina.perez@dtsc.ca.gov
(818) 717-6569

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Cassandra Owens
cowens@waterboards.ca.gov
(213) 576-6750